

1. Par, Inc., is a small manufacturer of medium- and high-priced golf bags. Par's distributor has agreed to buy all the golf bags Par produces over the next 3 months.

Each golf bag produced will require the following operations:

- (1) Cutting and dyeing the material
- (2) Sewing
- (3) Finishing (inserting umbrella holder, club separators, etc.)
- (4) Inspection and packaging

Each medium-priced golf bag will require $7/10$ hour in the cutting and dyeing department, $1/2$ hour in the sewing department, 1 hour in the finishing department, and $1/10$ hour in the inspection and packaging department. Each high-priced golf bag will require 1 hour for cutting and dyeing $5/6$ hour for sewing, $2/3$ hour for finishing, and $1/4$ hour for inspection and packaging. The unit profit is \$10 for every medium-priced golf bag and \$9 for every high-priced golf bag. It is estimated that 630 hours for cutting and dyeing, 600 hours for sewing, 708 hours for finishing, and 135 hours for inspection and packaging will be available for the production of golf bags during the next 3 months. The company's problem is to determine how many medium- and high-priced golf bags it should produce to maximize the total profit.

- (a) Formulate a linear programming (LP) model for this problem.
- (b) Solve this LP model by the graphical method.

2. A manufacturer produces three models, I, II, and III, of a certain product using raw materials A and B. The following table gives the data of the problem.

| Raw material | Requirement per unit | | | Availability |
|-----------------|----------------------|-----|-----|--------------|
| | I | II | III | |
| A | 2 | 3 | 5 | 4000 |
| B | 4 | 2 | 7 | 6000 |
| Minimum demand | 200 | 200 | 150 | |
| Unit profit(\$) | 30 | 20 | 50 | |

The labor time per unit of model I is twice that of II and three times that of III. The entire labor force of the factory can produce the equivalent of 150 units of model I. The market requirements specify the ratios 3:2:5 for the production of the three respective models.

- (a) Formulate the problem as a LP model.

- (b) Use the *OR Courseware* to solve the problem.
- (c) Suppose the manufacturer can purchase additional units of raw material A at \$9 per unit. Would it be advisable to do so?
- (d) Would you recommend that the manufacturer purchase additional units of raw material B at \$5 per unit?

3. Acme manufacturing company has received a contract to deliver home windows over the next 6 months. The successive demands for the six months are 100, 250, 190, 140, 220, and 110, respectively. Production cost varies per window from month to month. Acme estimates the production cost per window over the next 6 months to be \$50, \$45, \$55, \$46, \$53, and \$50, respectively. To take advantage of the fluctuation in manufacturing cost, Acme may elect to produce more units for delivery in later months. This, however, will incur storage costs at the rate of \$6 per window per month assessed on end-of-month inventory.

- (a) Develop a LP to determine an optimum production schedule for Acme.
- (b) Use the *OR Courseware* to solve the LP model.
- (c) Solve the problem again assuming that Acme has an initial inventory of 25 windows at the beginning of the first month.